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Elsa Keller
Intellectual Property Law Dept
170 Wood Avenue South
Iselin, NJ 08830

EXAMINER	
MILLER, MICHAEL G	

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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/786,349
Filing Date: February 25, 2004
Appellant(s): BUERGEL ET AL.

Janet D. Hood
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 08 JUL 2009 appealing from the Office action mailed 16 JAN 2009.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

EP 0525545	CZECH et al	07-1992
6500283	SCHAEFFER et al	10-1997

4878953	SALTZMANN et al	01-1988
4933239	OLSEN et al	03-1989
2003/0091755	KASHIRIN et al	08-2001
EP 0186797	HAYDON	12-1985

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

1) Claims 13, 15-16, 18, 21, 24, 30-32 and 34 are rejected under 35 U.S.C. 102(b) as being anticipated by Czech et al (European Patent 0525545, hereinafter '545).

2) With regard to Claim 13, '545 teaches a method for refurbishing a gas turbine blade made from a textured superalloy body coated with a protective coating (Page 2 Lines 22-24 and Lines 35-37), the method comprising the steps of:

   a) Coating a surface of said body with a high temperature stable surface coating, thereby covering said protective coating (Page 3 Lines 52-55 and Page 5 Lines 17-21);

   b) Restoring the microstructure of the superalloy body by performing a solution heat treatment on the body, thereby maintaining said thermally stable surface coating (Page 5, Lines 17-21, re-diffusion treatment, and 37-40, the heat treatment allows for removal of the non-single-crystal defects which restores the microstructure of the body after processing);

   c) Removing jointly said surface coating and said protective coating (Page 7 Lines 37-54; the remnants of the protective coating, being inside the aluminide layer, will be removed along with the aluminide layer); and

d) Providing a second protective coating on said body (Page 7 Lines 55-57).

3) With regard to Claim 15, '545 teaches the method according to Claim 13, wherein:

a) Said solution heat treatment is performed with a temperature above 1100^{o}C (Page 5 Lines 17-21).

4) Claim 18 is rejected on the same basis as Claim 15.

5) With regard to Claim 16, '545 teaches a method for refurbishing a gas turbine blade made from a textured superalloy body coated with a protective coating, the method comprising the steps of:

a) Removing the protective coating (Page 3 Lines 29-34);

b) Coating a surface of said body with a high temperature stable surface coating (Page 3 Lines 52-55 and Page 5 Lines 17-21);

c) Restoring the microstructure of the superalloy body by performing a solution heat treatment on the body, thereby maintaining said thermally stable surface coating (Page 5, Lines 17-21, re-diffusion treatment, and 37-40, the heat treatment allows for removal of the non-single-crystal defects which restores the microstructure of the body after processing);

d) Removing the surface coating (Page 7 Lines 37-54); and

e) Providing a second protective coating on said body (Page 7 Lines 55-57).

6) With regard to Claim 21, which multiply and distinctly includes the limitations of Claims 13 and 16 above, '545 teaches the method according to Claim 13/16, wherein:

a) Said surface is applied with an appropriate surface coating (Page 3 Lines 10-13; aluminide is taught to be an appropriate refurbishing coating).

7) With regard to Claim 24, which multiple and distinctly includes the limitations of Claims 13 and 16 above, '545 teaches the appropriate method according to Claim 13/16, wherein:

a) A metallic surface layer, in particular of nickel or cobalt is used (Page 3 Lines 10-13; aluminide, while not required to be composed of nickel or cobalt, will form a metallic surface layer).

8) With regard to Claim 30, '545 teaches a method for recovering texture of a textured article which is made from a superalloy, comprising the steps of:

a) Creating on the surface of the article a high temperature stable surface coating (Page 3 Lines 52-55 and Page 5 Lines 17-21);

b) Performing a solution heat treatment on said article wherein a γ -phase and a γ '-phase are present in said superalloy and the temperature of said solution heat treatment is at least the solution temperature of the γ'-phase, thereby maintaining said thermally stable surface coating (Page 5 Lines 17-21; the phases are present by virtue of the sulphur inclusions which form along grain boundaries which form along phase boundaries; the method of diffusion requires operation at the solution temperature of the γ'-phase for anything to occur;);

c) Restoring the microstructure of the textured article (Page 5 Lines 37-40, wherein the single-crystal structure is restored by removing the outer non-single-crystal structure);

d) And suppressing grain recrystallization by providing bulk conditions which assure a higher temperature threshold for grain recrystallization (inherent by the properties of solid-air and solid-solid heat interfaces).

9) With regard to Claim 31, which includes all the limitations of Claim 30 above, '545 teaches the method of Claim 30, wherein:

a) Said article is a gas turbine component (Page 2 Lines 1-3).

10) With regard to Claim 32, which includes all the limitations of Claim 31 above, '545 teaches the method of Claim 30, wherein:

a) Said gas turbine component is a blade or vane (Page 2 Lines 1-3).

11) With regards to Claim 34, which includes all the limitations of Claim 24 above, '545 teaches the method of Claim 24, wherein:

a) The surface layer is removed by means of an acid treatment (Page 3 Lines 39-42, further described in page 7 Lines 39-44).

12) Claims 14, 17, 19-20 and 28-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over '545 as applied to Claim 13/16 above, and further in view of '283.

13) With regard to Claim 14, which includes all the limitations of Claim 13 above, '545 teaches the method according to Claim 13, except for the following limitation:

a) A γ -phase and a γ '-phase are present in said superalloy and the temperature of said solution heat treatment is at least the solution temperature of the γ'-phase.

b) '283 discusses superalloys suitable for use in gas turbine components. Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to have applied the method of '545 to gas

turbine components formed as discussed in '283 since '545 wants to refurbish gas turbine parts and '283 teaches methods and materials that are suitable for that use.

c) '283 further teaches that superalloy solution heat treatments, when applied to either single crystal or directionally solidified alloy articles, are performed at the solution temperature of the superalloy, and further that this solution temperature is below the solidus temperature of the superalloy. Further, the diffusion temperature must be at least the γ '-temperature, otherwise diffusion would not be possible.

14) Claim 17 is rejected on the same basis as Claim 14.

15) With regard to Claims 19-20, which multiply and distinctly includes the limitations of Claims 13 and 16 above, '545 teaches the method according to Claim 13/16 except for the following limitation

a) The textured article is a single crystal article.

b) '283 teaches that it is known to form gas turbine components from single crystal structures (Column 1 Lines 15-33; the reason for the oxide scale film in this art is that the gas turbine components, even after being made from single crystal advanced superalloys, are still inadequate for the task).

c) Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to have applied the method of '545 to a single crystal article as described in '283 because '545 wants to treat textured gas

turbine components and '283 teaches that single crystal textured gas turbine components are known in the art.

16) Claim 20 is rejected on the same basis as Claim 19, as '283 talks about both single crystal and directionally solidified gas turbine components.

17) Claims 28 and 29 are rejected on the same basis as Claim 14, as the further limitation wherein the protective coating will suppress the grain recrystallization properties is inherent to this process.

18) Claims 22-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over '545 as applied to Claim 13/16 above, and further in view of Saltzman et al (U.S. Patent 4,878,953, hereinafter '953).

19) With specific regard to Claim 22, which multiply and distinctly includes all the limitations of Claim 13 and 16 above, '545 teaches the method according to Claim 13/16, except for the following limitation:

a) The surface layer is applied to a region which has been newly built up, in particular has been produced by build-up welding.

b) '953 teaches a method of building up an area of a gas turbine using welding techniques to repair certain defects (Column 3 Line 61 – Column 7 Line 3). '953 also teaches that its method of refurbishing is particularly useful in treating nickel-base superalloys with a gamma prime phase – a same class of material as taught in '545.

c) Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to have combined the methods of '545 and

'953 because '545 strives to remove inclusions and '953 is capable of repairing defects including inclusions (Column 3 Lines 62 – 66 specifically).

20) Claim 23 is rejected on the same grounds as Claim 22, as the citation in Claim 22 also covers repairing cracks (Column 3 Lines 62 – 66).

21) Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over '545 as applied to Claim 13/16 above, and further in view of Olson et al (U.S. Patent 4,933,239, hereinafter '239).

22) With specific regard to Claim 25, which multiply and distinctly includes all the limitations of Claim 13/24 and 16/24 above, '545 teaches the method according to Claim 24, except for the following limitation:

a) The metallic layer is applied by electroplating.

b) '239 teaches that it is known to deposit aluminides via electroplating (Column 7 Lines 1-22).

c) Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to have modified the method of '545 by electroplating the aluminide compound onto the substrate as taught in '239 because '545 wants an aluminide coating and '239 teaches that electroplating is a known method to obtain such.

23) Claims 26-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over '545 as applied to Claim 13/16 above, and further in view of Kashirin et al (U.S. PGPub 2003/0091755, hereinafter '755).

24)With specific regard to Claim 26, which multiple and distinctly includes all the limitations of Claim 13/24 and 16/24 above, ‘545 teaches the method according to Claim 24, except for the following limitation:

a) The surface layer is applied by cold gas spraying.

b) ‘755 teaches application of metallic surface layers to substrates (PG 0011 – 0031, TABLE which shows several compositions of greater than 2% Al).

c) Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to have applied the aluminide layer called for in ‘545 by the cold gas spraying method of ‘755, since ‘545 wants a method of aluminide deposition and ‘755 teaches a known method of doing such.

25)With regards to Claim 27, which includes all the limitations of Claim 26 above, '545/’755 teaches the method of Claim 26, wherein:

a) The surface layer is removed by means of an acid treatment (‘545 Page 3 Lines 39-42, further described in page 7 Lines 39-44).

26)Claim 33 is rejected under 35 U.S.C. 103(a) as being unpatentable over ‘545 as applied to Claim 30 above, and further in view of Haydon et al (European Patent 0186797, hereinafter ‘797).

27)With regard to Claim 33, which includes all the limitations of Claim 30 above, ‘545 teaches the method according to Claim 30, except for the following limitation:

a) Said superalloy is cobalt-based with precipitations or carbides that provide a strengthening mechanism similar to a γ-phase in Nickel based alloys.

b) '797 teaches a cobalt-based alloy with carbon and monocarbide-forming material inclusions added for the purpose of providing enhanced strengthening mechanisms to the alloy (Page 2 Line 22 – Page 3 Line 36).

c) Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to have performed the method of '545 on gas turbines formed by the material of '797 because '545 wants to refurbish gas turbine components and '797 teaches a material that is known for use in gas turbine components.

(10) Response to Argument

Response to Argument 7A: As cited in Czech, the prior art has a teaching of heating the material claimed by Applicant (a superalloy body) to a temperature range claimed by Applicant (a temperature above the solution temperature of one phase of the alloy, at least 1100 degrees Celsius) and restoring the microstructure of the superalloy body (removing inclusions from the surface of the blade and repairing the voids left behind by this process; see the grounds of rejection for Claims 13 and 15 above). Examiner has maintained the following interpretations throughout the history of this prosecution:

1) "Restoring the microstructure of the superalloy body" has been interpreted as "restoring the superalloy body to its previous undamaged state".

2) "Performing a solution heat treatment" has been interpreted as "raising the temperature of the superalloy body to a point where at least one phase of the alloy is put into solution".

Applicant contends that Czech teaches away from the application as claimed because of language that says “the temperature should always be kept well below the solution temperature of the base material alloy”. Examiner does not dispute this quotation; however, Examiner disagrees with Applicant's interpretation. Further claims by Applicant in this application, e.g. Claim 30, clearly show that there are multiple solution temperatures in an alloy because Applicant explicitly wants the solution heat treatment to be performed at a temperature which is at least the solution temperature of one phase. This is a different proposition entirely from the solution temperature of the entire alloy, which is a temperature high enough to place all phases in solution (in short, high enough to melt the base part, also known as the solidus temperature). The re-diffusion treatment of Czech must be a solution treatment, because it is not possible to diffuse material into a solid crystalline microstructure without placing at least part of it into solution. The reason for the incredible stability of crystalline structures is the incredibly high order of the molecular matrix; there simply isn’t room to insert more atoms into this sort of structure without breaking some of the bonds already in place. Therefore, the re-diffusion treatment must place at least one phase into solution for diffusion to be possible, and is therefore a solution heat treatment. Applicant further argues that Examples 1-6 of Czech, teaching partial diffusion of the aluminide into the blade, are not a solution heat treatment and that the aluminide does not penetrate into the base alloy. Examiner disagrees. As Applicant says, the portion of the aluminizing step is to encapsulate the corrosion to allow its removal. To completely encapsulate it, the aluminization MUST penetrate beneath the corrosion, preferably to a minimum

depth beneath it. Therefore, the aluminzation MUST diffuse into the base alloy to some degree. Finally, Applicant argues that different words have different meanings. Examiner agrees, but notes that different words can have overlapping meanings, as is the case here.

Response to Argument 7B: This argument follows, in condensed form, the critical points of Argument 7A and is addressed by Examiner's Response to Argument 7A above.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

/Michael G. Miller/

Examiner, Art Unit 1792

Conferees:

/Michael Cleveland/

Supervisory Patent Examiner, Art Unit 1792

/Benjamin L. Utech/

Primary Examiner